

later by Fracker (Ann. Ent. Soc. Am. XI: 274) as the same. It is named in remembrance of my good friend, the late E. P. Van Duzee, our great American hemipterologist.

This species conveys the impression in coloration of a smaller, more slender *Tollius curtulus*. It is readily distinguishable from this species by the form of the male claspers and by the antennal proportions. From *T. quadratus* Van Duzee it differs in the antennal proportions, the process on the outer angles of the quadrate male claspers and the length of rostral segment I.

#### REFERENCES.

- Fracker, S. B. 1918. The Alydinae of the United States. Ann. Ent. Soc. Am., XI: 255-282.  
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### MORE AMBUSH BUG PREY RECORDS (HEMIPTERA).

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In the Canadian Entomologist for March, 1939, I presented a list of 81 species of insects taken from the grasp of our common ambush bug, *Phymata pennsylvanica americana* Melin in the vicinity of the University of Illinois in 1938, and described the feeding habits of this bug as observed in nature. During the summer and fall of 1939, I supplemented the above records with further observations in the field in the same area. These new records are offered here, with additional notes, in the belief that the complete picture the entomologist should eventually produce of insect bionomics can be obtained only by a series of observations made in the different parts of its range and under the varied ecological conditions imposed on them by successive years.

*Records of the Two Years Compared.* Excepting the Homoptera, which are represented in the list for 1938 by a single Cicadellid, the prey utilized by this phymatid in the two years belongs to identical orders. These are Coleoptera, Hymenoptera, Lepidop-

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TABLE I.—(Continued)

Genus	Species	Family	Specimens Captured	Inclusive Dates
	HYMENOPTERA.—(Cont.)			
<i>Paralictus</i>	<i>cephalotes</i> (D. T.)	Andrenidae	1	IX-23
<i>Melissodes</i>	<i>nivea</i> Robt.	Andrenidae	3	IX-7: IX-8
<i>Sphécodes</i>	<i>levis</i> Lov. & Ckll.	Andrenidae	4	VII-29: IX-22
<i>Sphécodes</i>	sp.	Andrenidae	1	IX-12
<i>Coelioxys</i>	<i>sayi</i> Robt.	Megachilidae	1	IX-18
<i>Holcopasites</i>	<i>illinoensis</i> Robt.	Megachilidae	1	IX-19
<i>Hylaeus</i>	<i>zeisae</i> (Robt.)	Hylaeidae	1	IX-7
<i>Odynerus</i>	<i>anormis</i> Say	Vespidae	1	IX-8
<i>Cerceris</i>	sp.	Sphécidae	1	IX-22
<i>Sphex</i>	<i>placidus</i> (F. Sm.)	Sphécidae	1	IX-29
<i>Psen</i>	<i>cressoni</i> (Robt.)	Sphécidae	1	IX-25
	LEPIDOPTERA			
<i>Pieris</i>	<i>protodice</i> Bdv. & Lec.	Pieridae	3	IX-11: IX-19
<i>Colias</i>	<i>eurytheme amphidusa</i> Bdv.	Pieridae	1	IX-11
<i>Colias</i>	<i>eurytheme eriphyle</i> Edw.	Pieridae	3	IX-23: IX-25
<i>Everes</i>	<i>comyntas</i> (Godt.)	Lycaenidae	4	VII-22: VIII-16
<i>Phyciodes</i>	<i>tharos</i> (Dru.)	Nymphalidae	1	VIII-16
<i>Urbanus</i>	<i>communis</i> (Grt.)	Hesperiidae	1	IX-15
<i>Polites</i>	<i>peckius</i> (Kirby)	Hesperiidae	2	VII-22: VIII-4
<i>Polites</i>	<i>themistocles</i> (Latr.)	Hesperiidae	2	IX-11: IX-12
<i>Feltia</i>	<i>subgothica</i> (Haw.)	Phalaenidae	3	IX-5: IX-13

TABLE I.—(Continued)

Genus	Systematic Position of Prey Taken	Species	Family	Specimens Captured	Inclusive Dates
		LEPIDOPTERA.—(Cont.)			
<i>Agrotis</i>		<i>gladiaria</i> Morr.	Phalaenidae	1	IX-25
<i>Autographa</i>		<i>brassicae</i> (Riley)	Phalaenidae	1	IX-20
<i>Caenurgina</i>		<i>crassiuscula</i> (Haw.)	Phalaenidae	1	IX-11
<i>Ciseps</i>		<i>fulvicollis</i> (Hbn.)	Amatidae	1	VII-29
Green caterpillar			Geometridae	1	September
		DIPTERA			
<i>Eugnoriste</i>		<i>occidentalis</i> Coq.	Mycetophiliidae	4	VII-29; IX-11
<i>Sciara</i>		sp.	Mycetophiliidae	1	IX-25
<i>Empis</i>		<i>clausa</i> Coq.	Empididae	15	IX-5; IX-9
<i>Saltella</i>		<i>scutellaris</i> (Fall.)	Sepsidae	1	IX-19
<i>Zodion</i>		sp.	Conopidae	1	IX-5
<i>Oocomyia</i>		(possibly <i>loraria</i> Lw.)	Conopidae	18	IX-7; IX-15
<i>Systoechus</i>		<i>vulgaris</i> Lw.	Bombyliidae	1	IX-5
<i>Sparnopolius</i>		<i>brevirostris</i> Macq.	Bombyliidae	7	IX-5; IX-12
<i>Desmometopia</i>		<i>M-nigrum</i> Zett.	Agromyzidae	1	IX-11
<i>Milichiella</i>		sp.	Agromyzidae	1	IX-14
<i>Sapromyza</i>		sp.	Sapromyzidae	1	IX-9
<i>Chloropisca</i>		<i>glabra</i> (Mg.)	Chloropidae	1	IX-15
<i>Oscinella</i>		<i>coxendix</i> (Fitch)	Chloropidae	1	IX-15
<i>Hippelates</i>		sp.	Chloropidae	1	IX-11
?		?	Anthomyidae	1	IX-12
<i>Linnophora</i>		sp.	Anthomyidae	1	IX-20

TABLE I.—(Continued)

Systematic Position of Prey Taken		Family	Specimens Captured	Inclusive Dates
Genus	Species			
	DIPTERA.—(Cont.)			
<i>Hylemya</i>	sp.	Anthomyidae	2	IX-18; IX-22
<i>Sarcophaga</i>	<i>tenuiventris</i> V. d. W.	Sarcophagidae	1	IX-7
<i>Sarcophaga</i>	<i>thermimeri</i> R. D.	Sarcophagidae	2	IX-5; IX-12
<i>Sarcophaga</i>	sp.	Sarcophagidae	1	IX-29
<i>Senotainia</i>	sp.	Sarcophagidae	1	IX-25
<i>Cochliomyia</i>	<i>macellaria</i> (F.)	Sarcophagidae	1	IX-6
<i>Lucilia</i>	<i>illustris</i> (Mg.)	Calliphoridae	1	IX-12
<i>Pollenia</i>	<i>rudis</i> (F.)	Calliphoridae	1	VII-14
<i>Stomoxys</i>	<i>calcitrans</i> (L.)	Muscidae	2	IX-7; IX-12
<i>Musca</i>	<i>domestica</i> L.	Muscidae	1	IX-7
<i>Cistogaster</i>	<i>immaculata</i> Macq.	Tachinidae	1	IX-15
<i>Cylindromyia</i>	? <i>fumipennis</i> (Walk.)	Tachinidae	2	IX-15; IX-21
<i>Cylindromyia</i>	sp.	Tachinidae	1	IX-23
<i>Leucostoma</i>	<i>atra</i> Tns.	Tachinidae	3	VII-29; IX-7
<i>Siphona</i>	<i>geniculata</i> DeG.	Tachinidae	1	IX-7
<i>Hyalomya</i>	<i>aldrichi</i> Tns.	Tachinidae	1	IX-5
<i>Paradidyma</i>	<i>singularis</i> Tns.	Tachinidae	2	IX-18; IX-19
<i>Gymnosoma</i>	<i>immaculata</i> (Macq.)	Tachinidae	4	IX-8; IX-22
<i>Gymnosoma</i>	<i>occidua</i> (Walk.)	Tachinidae	5	IX-8; IX-22
<i>Zenillia</i>	sp.	Tachinidae	1	VIII-16
<i>Cuphocera</i>	sp.	Tachinidae	13	IX-5; IX-22
<i>Phorocera</i>	sp.	Tachinidae	1	IX-13

TABLE I.—(Continued)

Genus	Systematic Position of Prey Taken	Species	Family	Specimens Captured	Inclusive Dates
		DIPTERA.—(Cont.)			
<i>Plagiomima</i>		sp.	Tachinidae	5	IX-7: IX-13
<i>Limnaemyia</i>		sp.	Tachinidae	2	VII-16: IX-14
<i>Archytas</i>		sp.	Tachinidae	1	IX-21
?		?	Tachinidae	4	VIII-16: IX-25
<i>Eristalis</i>		<i>meigenii</i> (Wd.)	Syrphidae	4	IX-5: IX-19
<i>Eristalis</i>		<i>tenax</i> (L.)	Syrphidae	12	IX-13: X-16
<i>Eristalis</i>		<i>aeneus</i> Scop.	Syrphidae	1	IX-8
<i>Chrysogaster</i>		<i>nitida</i> (Wied.)	Syrphidae	2	IX-8: IX-9
<i>Mesogramma</i>		<i>geminata</i> (Say)	Syrphidae	4	IX-11: X-6
<i>Mesogramma</i>		<i>polita</i> Say	Syrphidae	1	IX-22
<i>Syritta</i>		<i>pipiens</i> (L.)	Syrphidae	9	VII-14: IX-20
<i>Platychirus</i>		<i>hyperboreus</i> Will.	Syrphidae	1	IX-20
<i>Sphaerophoria</i>		<i>cylindrica</i> (Say)	Syrphidae	8	VIII-4: X-6
<i>Baccha</i>		<i>fascipennis</i> Wd.	Syrphidae	1	IX-6
<i>Paragus</i>		<i>bicolor</i> (Fab.)	Syrphidae	1	IX-18
<i>Syrphus</i>		<i>americanus</i> (Wd.)	Syrphidae	1	IX-7
<i>Syrphus</i>		sp.	Syrphidae	1	IX-20
<i>Syrphus</i>		sp.	Syrphidae	1	IX-15
		HEMIPTERA			
<i>Adelphocoris</i>		<i>rapidus</i> (Say)	Miridae	5	VII-29: IX-18
<i>Lygus</i>		<i>pratensis</i> (L.)	Miridae	2	IX-11
?		?	Pentatomidae	1	VIII-16



tera, Diptera and Hemiptera. The distribution by orders, of the prey taken, is summarized in Table 2.

TABLE 2. CHOICE OF PREY, BY ORDERS.

Order	1938			1939		
	Number of Species	Number of Specimens	Per Cent of Total	Number of Species	Number of Specimens	Per Cent of Total
Coleoptera . . .	6	55	22.0	4	16	5.44
Hymenoptera . .	17	36	14.4	27	83	28.22
Lepidoptera . .	16	51	20.4	14	25	8.50
Diptera . . . . .	33	83	33.2	56	162	55.09
Hemiptera . . .	8	24	9.6	3	8	2.72
Homoptera . .	1	1	0.4	0	0	0.00
Totals . . . . .	81	250	100%	104	294	100%

The figures in the percentage columns show considerable differences in the proportionate prey value of the several orders in the two years. In the Coleoptera, the difference is due to the comparative scarcity, in the habitats investigated, of the three species of *Diabrotica*,—*duodecimpunctata*, *vittata* and *longicornis* in 1939. In 1938, the honey bee was the principal species of Hymenoptera taken as prey. However, the decline exhibited in it in 1939 was more than offset by the abundance, in both individuals and species, of its smaller andrenid relatives. In the order Lepidoptera, numerical decreases in 1939 in *Colias eurytheme*, *Phyciodes tharos* and *Feltia subgothica* are particularly striking. The number of Diptera secured in 1939 was double that in 1938. In the latter year, *Eugnoriste occidentalis*, *Archytas* sp. and *Pollenia rudis* ranked among the most common prey taken, but these flies are somewhat meagerly represented in the list for 1939. However, a greatly increased use was made of *Empis clausa*, *Syrirta pipiens* and *Eristalis tenax* in 1939. Yet most of the addition in the fly order is explained by the advent of species not represented at all in the list for 1938. Especially noteworthy among these are the conopid, *Oc-comyia*; the bombyliid, *Sparnopolius brevirostris*; the tachnid, *Cuphocera* sp., and the syrphid, *Sphaerophoria cylindrica*. The decrease in number of Hemiptera in 1939 is clearly explained by the comparative scarcity of *Lygus pratensis* in the localities under investigation.

*Feeding in Relation to Sex.* In the two years, I took 443 insects that included notice of the sex of the ambush bug concerned as the predator. Of this number, 349 were found held by females

and 94 had been caught by males. Thus, 78.8 per cent. or almost four-fifths of the total prey individuals were caught and killed by the female, and only 21.2 per cent by the male. That this disparity in rate of feeding is not traceable, to any significant degree, to numerical superiority of the females is shown by the ratio of sexes observed in 1939. Of 2611 adult individuals recorded, 1324 were females and 1287 males,—a difference of only 37 in favor of the females. The latter sex is therefore actually about four times more voracious than the somewhat smaller males. This quantitative discrepancy in food utilized is probably correlated with the rather large egg yield of the species. A larger amount of nutritious matter is required to produce eggs than is needed for spermatogenesis. During much of their productive periods, the females of a series observed in captivity deposited an egg mass at about four-day intervals. These masses usually contained 12 to 20 eggs each.

In addition to capturing only about one-fifth as much prey as the females, the males secure captives that are, in general, smaller than those seized by their mates. The mycetophilids, *Eugnoriste* and *Sciara*, and the empidid fly, *Empis clausa*, are the smallest prey forms caught in greater numbers by this ambush bug. Of the 27 captured specimens of these small flies, 19 were found in the grasp of males. On the other hand, the males capture almost negligible numbers of the largest prey species, such as noctuid moths, skippers, pierid butterflies, the syrphid fly, *Eristalis tenax*, tachinids of the genus *Archytas*, and the honey bee. Of the 72 individuals of these larger forms collected, 70 were taken from the grasp of females, and only two, which were noctuids, were held by males. It is of interest also that the two largest and strongest Hymenoptera captured were secured by females. One was a male of the parasitic bumble bee, *Psithyrus variabilis*, the other a *Sphex placidus*. In 1939 the latter species was common in the ambush bug habitats. The capture of these Hymenoptera, even by the females, was made possible only by the low atmospheric temperatures prevailing on the dates of capture.

Of the above 349 females found feeding, 250 were single, 93 coupled with males,—i.e., males riding on the backs of their mates, and three were in the copulatory position. Of the 94 feeding males, 78 were single, 16 coupled with females, and none in copulation.

Other feeding combinations are noteworthy. Both the males and females of seven couples fed simultaneously on a single captive insect, probably usually captured by the females. In one instance, two single females were engaged concurrently in sucking out the contents of a 12-spotted *Diabrotica*. Again, two coupled females fed at the same time on a moth (*Autographa brassicae*). Incidentally, this is the only time two females have been seen to date in



that posture and it was perhaps purely incidental to the preying process.

In another instance, the females of two coupled pairs shared a skipper (*Polites peckius*), and in still another kind of combination, the male and female of a coupled pair had each captured a prey specimen and was found feeding on its own catch. In two instances of the latter type, the females held noctuid moths, while the males had secured flies. In another kind of relation, an ambush bug and an adult assassin bug (*Sinea diadema*) were seen, on two occasions, feeding simultaneously on one insect. A tachinid fly (*Gymnosoma*) and a syrphid (*Eristalis tenax*) were the prey species involved.

*Miscellaneous.* Observations made in 1939 on the ambushing habits and the killing, feeding and discarding processes of *Phymata* entirely confirm the statements made in my earlier paper (1939). In each year, all prey specimens obtained were winged adults, excepting a nabid nymph, taken in 1938, and a small slender geometrid larva and a pentatomid nymph, taken in 1939. Some insects present in the *Phymata* habitats again regularly or almost always escaped capture. Most noteworthy are the soldier beetle, *Chauliognathus pennsylvanicus* and the slender-waisted wasp, *Sphex placidus*, which were abundant and common, respectively. Additional ambush plants noted are fever few (*Parthenium integrifolium*) and *Kuhnia eupatorioides*. The first is not plentiful, and ambush bugs occurred on it infrequently, but as many as 20 bugs were seen on each of several days on a single bushy individual of *Kuhnia* at the peak of its blooming period. The flowers of both these plants are greyish green. The principal ambush plants in the habitats visited were a species of *Bidens* with conspicuous yellowish-orange rays, and the abundant small-flowered, white-rayed late-blooming aster, *Aster multiflorus*. As in 1938, several adult ambush bugs were discovered probing the heads of Compositae with their beaks as if seeking to obtain nectar.

Diptera constituted the prey taken in most consistently high numbers. While forming a large part of the total captives, andrenid bees exhibited conspicuous numerical variation, particularly on September 12, 13 and 14. Of the 39 prey specimens collected on the twelfth, 19 were andrenid bees but, for reasons still unknown, no bees of any kind were in possession of the bugs in the same place on the thirteenth, and only two such were obtained on September 14. Yet a good number of flies were caught on the latter two days, and particularly on the thirteenth.

#### REFERENCE CITED.

- Balduf, W. V., Food habits of *Phymata pennsylvanica americana* Melin, Canadian Entomologist, 71, 1939, 66-74, 2 tables.